FRCM CHAPTER 6
TRAINING AND QUALIFICATION

Revision History

Author	Description of Change	Revision Date
J. D. Cossairt	1. Revision of Article 622 to improve clarity and better reflect actual practice. 2. Revision of Article 653 to institute corrective actions applied to ORPS SC—FSO-FNAL-FERMILAB-2014-0002. 3. Editorial changes applied as needed.	April 2014
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CHAPTER 6 TRAINING AND QUALIFICATION

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PART 1 GENERAL REQUIREMENTS

611 Purpose and Introduction

This chapter establishes the requirements to ensure that personnel have the training to work safely in and around radiological areas and to maintain their individual radiation exposure and the radiation exposures of others As-Low-As-Reasonably-Achievable (ALARA). Training requirements in this chapter apply to all individuals, except visitors and minors, entering areas at Fermilab controlled for radiological purposes as defined in Chapter 2 of this Manual. Included are Laboratory employees, subcontractor employees, and scientific users. The training requirements for non-occupational- visitors and minors are discussed in Article 941 and 931, respectively.

1. The basic objective of radiological safety training is to enable those who work at the Laboratory to work safely, efficiently, and competently in areas controlled for radiological purposes and with radioactive materials. To accomplish this objective, it is necessary to instruct individuals on procedures, practices and regulations designed to minimize exposures and to inform them of the potential risks involved in radiation exposure.

2. Responsibilities

   a. Divisions/Section/Center/Heads- It is the responsibility of division/ section/center heads to implement the Laboratory's environment, safety and health training programs, including radiological training, for their personnel. For purposes of this article, contractors and individuals from other institutions who use Fermilab research facilities (i.e., "users") are treated as equivalent to Fermilab personnel who work in the same type of radiological areas. The training requirements are implemented by the division/section/center responsible for the areas in question. It is the responsibility of the supervisors to ensure that employees under their supervision maintain training that complies with the requirements of this Manual.

   b. Environment, Safety, Health, and Quality (ESH&Q) Section - The ESH&Q Section provides the labwide radiological training specified in other Articles of this Chapter in accordance with policies stated in the Fermilab ES&H Manual (FESHM). The ESH&Q Section works with the divisions/sections/centers to assure lab wide implementation of standardized radiological training. The ESH&Q Section also routinely provides specialized radiological training in the following areas:

      (1) Radioactive source training
      (2) Material move survey training
      (3) Special emergency exposure training (see Article 922).

612 Procedures

1. ESH&Q Training Database- Training status should be entered and tracked in accordance with current procedures developed by the ESH&Q Section for utilizing the Fermilab Environment, Safety, and Health (ES&H) Training Records, and Information Network Database (TRAIN). This database comprises the permanent repository at Fermilab of training status. It should be downloaded by divisions/sections to facilitate their radiological control and operational programs.

2. Transfer of Training from other Department of Energy (DOE) Sites- Successful completion of the courses for General Employee Radiological Training (GERT), Radiological Worker (RW), and Radiological Control Technician (RCT) within the past two years at another DOE site shall be recognized by Fermilab, provided sections a through d are satisfied. This does not exempt the individual from other training required by the division/section/center, such as Controlled Access, ODH, etc.

    a. Individual must provide documentation of successful completion of the course. Documentation of the previous training shall include the individual's name, date of training, topics covered, and the name of the certifying official. A copy of this certification shall be sent to the ESH&Q Section.

    b. Fermilab-specific aspects of the academic portions of radiological training shall be completed. For GERT and RW training, providing the individual with training materials addressing site-specific information can accomplish this. The individual should sign that he/she has read and understands the site-specific information presented. This document (RP Form 89) shall also be sent to the ESH&Q Section.

    c. To be fully qualified as a radiological worker at Fermilab, in addition to the site-specific academics, the individual must also successfully complete the practical factors component of RW training.

    d. Fermilab-specific aspects of RCT Training will be provided on an individual basis.

3. Transfer of Training to other DOE Sites- The non-site specific part of the radiological training received at Fermilab is acceptable by other DOE facilities. A completed RP Form #90, signed by an authorized instructor should be used as proof of this training.

613 Requirements

1. All radiological safety training should encompass at least the following topics, to the extent appropriate based on the degree of exposure to potential radiological hazards:

   a. Risks of exposure to radiation and radioactive materials, including prenatal radiation exposure;

   b. Basic radiological fundamentals and radiation protection concepts;

   c. Physical design features, administrative controls, limits, policies, procedures, alarms, and other measures implemented at the facility to manage doses and maintain doses ALARA, including both routine and emergency actions;

   d. Individual rights and responsibilities as related to implementation of the facility radiation protection program;

   e. Individual responsibilities for implementing ALARA measures required by Part 5, Chapter 3 of this manual; and

   f. Individual exposure reports that may be requested in accordance with Article 781.

2. Each individual shall complete, at a minimum, GERT, (See Part 2 of this Chapter):

   a. Before being permitted unescorted access to controlled areas; and

   b. Before receiving occupational dose during access to controlled areas at a DOE site or facility.

3. Examinations shall be used to verify the appropriate level of knowledge of radiological safety. Examinations should be written. However, alternative methods with the approval of the Senior Radiation Safety Officer (SRSO) may be used to accommodate special needs. The examination process requires:

   a. A minimum acceptable score be established;

   b. True/false questions not be included;

   c. The use of questions selected from a question bank;

   d. Remedial actions for failure to meet the minimum score. Remedial actions taken should be documented. A fully qualified individual must

directly supervise the individual until remedial actions have been completed.

4. In addition to the examination required in paragraph 3, practical factors are required for qualification as a radiological worker or Radiological Control Technician and before:

   a. Being permitted unescorted access to radiological areas,

   b. Performing unescorted assignments as a radiological worker.

5. Radiological safety training shall be completed every 24 months. This interval may be extended by a period not to exceed 30 days to accommodate scheduling needs. In such a case, the written approval of the Division/Section/Center Radiation Safety officer (RSO) must be obtained. Significant changes to the program should be incorporated as they are identified and a decision made by the SRSO if retraining or a suitable alternative method of communicating the changes shall be employed.

6. When an escort is used in lieu of training, the escort shall:

   a. Be fully qualified for entry to the area and performance of the work; and

   b. Ensure that all escorted individuals comply with the documented radiation protection program.

   c. Advise the individual to attend the appropriate radiation safety training, if appropriate.

   d. Arrange for the individual to receive an orientation commensurate with the areas to be entered addressing the topics contained in paragraph 1 of this Article. Records of this orientation should be retained.

   e. If the work will be in a radiological area or involve radioactive materials, coordinate a review of the work by the Division/Section/Center RSO for the purpose of estimating the potential exposure to the individual. Issuance of dosimetry should be in accordance with the requirements of Chapter 5, Part 1 of this manual.

7. Verification of the effectiveness of radiological control training should be accomplished as a part of audits conducted as a part of the Fermilab ES&H appraisal program discussed in FESHM 1040.1 “ES&H Self Assessment Program”.

8. Reading and comprehension skills in the English language are generally necessary for radiological training. Orientation provided by the Division/Section/Center RSO and the use of trained escorts/translator can be determined to provide an

alternative to the completion of training with the concurrence of the SRSO. The Division/Section/Center RSO should inform the worker of the exposure limits, risk associated with the radiation exposure, the anticipated exposure for the job, and any other hazards and associated risks that may be involved (e.g. ODH, Lock Out Tag Out).

9. Training records and course documentation shall meet the requirements of Article 723.

10. The SRSO has approval authority over Fermilab-generated radiological training material.

PART 2 RADIOLOGICAL SAFETY TRAINING

621 General Employee Radiological Training (GERT)

Due to the presence of numerous postings for radiological purposes, individuals who enter, without an escort, areas controlled for radiological purposes, or may encounter radiological postings (see Chapter 2) shall receive GERT unless they are required to receive RW Training.

1. GERT shall include the topics outlined in Article 613.1 at a level of detail commensurate with the radiological hazards that may be encountered in Controlled Areas and Radioactive Material Areas.

2. Additional training beyond GERT is necessary for unescorted entry into Controlled Areas where a dose of 100 millirem (mrem)/year or more is possible, Radiation Areas, Contamination Areas, Airborne Radioactivity Areas, and to work with radioactive materials and in Radioactive Materials Areas. Personnel receiving RW Training are not required to receive GERT.

3. Classroom lecture, videotape, or other applicable methods may be used to communicate information.

622 Radiological Worker Training (RW)

Workers whose job assignments require unescorted access to radiological areas, require the handling of radioactive materials, or may receive a dose of 100 mrem or more in a year shall complete RW Training. Training shall either precede assignment as a radiological worker or be concurrent with assignment as a radiological worker if the worker is accompanied by and under the direct supervision of a trained radiological worker (see Article 613.5).

1. Initial RW Training is normally accomplished in person in a class room course of approximately one day duration. At the discretion of the Division/Section/Center RSO, this requirement may be waived and the passing of a comprehensive

challenge examination may satisfy the academic part of the RW Training requirement.

2. A comprehensive challenge exam may be used for renewal of the academic part of the training and, in some situations for the initial portion. One attempt to pass the challenge exam is allowed. If the individual fails the exam, the classroom portion of the Radiological Worker training shall be completed. Practical factors modules of such training cannot be challenged. Under exceptional circumstances, such as language barriers, this training may take other forms based on the Division/Section/Center RSO recommendation and concurrence of the SRSO.

3. RW Training shall address the topics outlined in Article 613.1 at a level of detail commensurate with typical radiological hazards that may be encountered in a radiological area at Fermilab.

4. RW Training should encompass the following practical factors:

   a. Donning of protective clothing.

   b. Surveying and disposing of protective clothing.

   c. Proper use of dosimetry and dosimetry records.

   d. Verification of instrument response and source check.

   e. Performance of frisking for personnel contamination, and frisking and surveying and labeling of equipment.

623 Other Fermilab-Specific Radiological Worker Training

1. Specialized radiological worker training should be completed for nonroutine operations or work in areas with changing radiological conditions. This training is in addition to RW Training and is required for personnel planning, preparing and performing specific jobs that have the potential for high radiological consequences. Such jobs may involve special containment devices, the use of mockups and ALARA considerations (see Article 356). Such training should be documented.

2. Work with radioactive sources at Fermilab requires the completion of RW Training followed by specialized radioactive source training. This training is needed to assure that the source users have a full understanding of their responsibilities regarding sources. The course builds upon the general information about ionizing radiation provided in RW Training.

3. Material Move Survey Training is required for individuals performing the radiation surveys required by the Material Move Request Form (MMR), when

there is a need to determine if some item is radioactive or not. MMR Training is not required to sign the MMR form if a survey is not required, i.e., the initiator knows from process knowledge that the item in question cannot be radioactive. This course has RW as a prerequisite as it uses concepts presented in that class concerning how to deal with radioactive materials, should they be identified.

4. Personnel called upon to receive emergency exposures in accordance with Article 922 shall receive special training in accordance with the provisions of 10 CFR 835.1302.

Table 6-1 Radiological Worker Training Requirements

AREAS	TRAINING REQUIREMENT	
	Entry Only	**Working with Radioactive-Material**
Controlled Area	GERT or RW	RW
Radioactive Material Areas	GERT or RW	RW
Radiation Areas (<100 mrem/hr)	RW	RW
High or Very High Radiation Areas (≥ 100 mrem/hr)[1]	RW	RW
Contamination Areas and High Contamination Areas	RW	RW
Airborne Radioactivity Areas[2]	RW	RW

[1]Entry requirements further restricted by Article 333, 234.7-9.

[2]If there is a potential for contamination or internal exposure due to the airborne radioactivity, respiratory protection may be required (see Chapter 3 Part 5 of this Manual).

PART 3 RADIOLOGICAL CONTROL TECHNICIAN QUALIFICATION

631 Requirements

Training and qualification of RCTs shall address routine operations. It should also focus on recognizing and handling situations in both normal and changing radiological conditions. Newly qualified technicians and those in training should be given the opportunity to work with qualified, experienced technicians to foster development. The level of training shall be commensurate with the technician's assignment.

632 Radiological Control Technician

1. Fermilab's Radiological Control Technician Training Implementation Plan documents RCT DOE core academic, site specific, continuing requalification, and on-the-job training requirements.

2. RCT Training shall include information based on job task analysis and essential job functions.

3. RCT candidates who have prerequisite knowledge, such as college credit, operational experience, National Registry of Radiation Protection Technologists (NRRPT) registration, or related qualifications, may satisfy the academics portion of the standardized training requirements by passing a comprehensive challenge exam. If the comprehensive challenge exam is not successfully passed in one attempt, the entire academic phase should be completed. The challenge exam does not exempt the candidate from the site-specific academics, practical factors, and on-the-job training.

4. Entry-level prerequisites should be established to ensure that RCTs meet standards for physical condition and education. At a minimum, these standards should include the following:

   a. High school education or equivalency.

   b. Fundamentals of mathematics and science.

   c. Reading, comprehension, and writing skills sufficient to follow procedures, write radiological work permits, prepare survey maps, write reports and prepare shipping and transfer permits.

   d. Ability to work in a support role, including communicating verbal instructions to others.

   e. Physical requirements to handle Personal Protective Equipment, other equipment and assist others in work locations, commensurate with assignment.

5. RCTs are encouraged to pursue registration by the NRRPT.

633 Continuing Radiological Control Technician Training

1. RCT continuing requalification training is conducted on a two-year training cycle. RCTs complete a total of 24 hours of continuing training over a two-year interval. Successful completion of examinations with passing scores of 80% are required for RCT requalification.

2. RCT continuing requalification training consists of selected topics from the DOE core academic training and/or site-specific training as outlined in Fermilab's RCT Training Implementation Plan. In addition, requalification includes on-the-job training conducted during the two year cycle.

3. Successful completion of an examination on the topics listed above and any specified practical demonstration of required tasks as determined by the Division/Section/Center RSO is required for requalification.

4. Personnel who maintain qualifications as RCTs are considered to have satisfied the requirements of Radiological Worker training.

5. As appropriate and in consultation with their supervision, RCTs are highly encouraged to participate in the following activities:

   a. Continuing education seminars.

   b. Review of established RCT Training materials.

   c. Review of relevant health physics/radiation protection documents, i.e., Radiation Safety Subcommittee Meeting Minutes, regulatory guidance, applicable Radiation Protection and Environmental Protection Notes, Health Physics Newsletter, Health Physics Journal, Operation Radiation Safety Journal and the NRRPT Newsletter.

   d. RSO Training Sessions.

   e. Miscellaneous activities, i.e. tours of other radiological facilities, investigation of an aspect of radiological protection, off-site training, and evening/weekend courses.

PART 4 OTHER RADIOLOGICAL TRAINING

641 Management Training

Line Managers (Fermilab supervisors) who manage, supervise or provide oversight of individuals performing radiological work should be trained in the principles of this FRCM.

642 Support Personnel

Appropriate support personnel (engineers, schedulers, procedure writers) should be trained in the principles of ALARA, basic ALARA techniques and dose reduction techniques commensurate with their job function and the radiological hazards potentially to be encountered by the individuals using the work plans. This may be accomplished by participation in GERT or RW training. They should also participate in selected portions of job-specific and specialized training, particularly in situations using mock-ups.

643 Radiological Control Personnel

1. Radiological control technical staff and management should have:

a. A combination of education and experience commensurate with their job responsibilities as determined by the responsible Division/Section/Center Head.

b. Continuing training based on an assessment of job responsibilities to maintain and enhance proficiency.

c. Continuing training to remain cognizant of changes to the facility, operating experience, procedures, regulations and quality assurance requirements.

d. Training on topics from Radiological Worker and Radiological Control Technician training and additional job-specific topics, as applicable.

2. Certification and involvement with professional industry organizations such as the American Board of Health Physics is encouraged.

644 Radiographers

As part of the subcontract with the companies that are commissioned to conduct radiographic surveys at Fermilab, it is required that radiographers shall have training in accordance with the requirements of 10 CFR 34.43 or equivalent state regulations.

645 Emergency Response Personnel

Provisions should be in place to accommodate rapid access to the radiological area by on site and off site emergency workers such as firefighters, medical personnel, and security personnel.

1. Emergency response personnel may be required to work in radiological areas.

2. Emergency response personnel should receive special radiological worker training commensurate with the situations they are likely to encounter.

3. Such training should be based on the Radiological Worker course materials.

4. If such workers are not trained, trained escorts should be assigned.

5. Training should make it clear that medical surveillance and lifesaving have priority over radiological controls.

6. The specific provisions of 10 CFR 835.1301 shall be implemented.

7. This training should be documented in accord with requirements for ES&H training documentation.

PART 5 TRAINING FOR SPECIAL APPLICATIONS

651 Uranium Facilities—provided in the event that work with depleted uranium is to be done

The following topics should be considered in addition to standardized training requirements at uranium facilities in the event that work involving the extensive handling of depleted uranium is conducted:

1. Properties of depleted uranium.

2. Special radiological surveys and techniques.

3. External and internal exposure control.

4. Toxicological properties and behavior of uranium.

5. Release of uranium-contaminated materials.

6. Instruments and measurement techniques.

7. Personnel protection.

8. Inventory control and accountability.

9. Biological effects.

10. Emergency response considerations.

652 Accelerator and Beamline Operators Radiological Training

This training program will consist of current Radiological Worker Training augmented by a series of lectures including the following topics as appropriate. The division/section/center responsible for the operation will develop this training program. Participation in this training program shall be documented.

1. Interlock systems, radiation detectors, and associated electronics.

2. Search and secure procedures.

3. Emergency response.

4. Radioactive water cooling systems.

5. Residual activity.

6. Prompt radiation fields.

7. Beam operation procedures intended to minimize the generation of radiation and consequent exposures.

653 Controlled Access Training

A controlled access is an entry into a beam area under conditions such that the integrity of the radiation safety interlock system is maintained, and/or an Opening Up or Initial Entry survey has not been performed in the area. All personnel authorized for controlled accesses shall maintain current RW Training

1. The training for those who are to be authorized to make unescorted controlled accesses shall include the following elements:

   a. Dose rates in beam areas with beam on.

   b. Posting and labeling requirements and relevance of posting/labeling in view of subsequent accelerator or beamline operations.

   c. The functional nature of the interlock system and key control. This includes the requirement that each person entering an interlocked enclosure must physically display his/her key to other personnel participating in the access upon entry into the enclosure to ensure that each individual has the correct key for the enclosure entered.

   d. Radiation surveys and instrumentation (as applicable).

   e. Emergency procedures. This includes the requirement that if any participant in a controlled access discovers that he/she or anyone else has entered an enclosure without the correct key, or if he/she has otherwise deviated from the controlled access procedures, he/she is to immediately exit the enclosure without using the controlled access procedure, thereby dropping the interlocks. In such an event, the Main Control Room shall be called and the circumstances reported.

      If a person is found to have entered an enclosure on controlled access without the proper key (or if there are other departures from the procedure), dropping the interlocks will force a search and secure of the enclosure to be performed before enabling beam in the enclosure. A search and secure is necessary since the integrity of the controlled access process has been compromised. It is required even if the access participants think they have accounted for all personnel after it is discovered that an individual has entered without the proper key.

f. Visitor regulations.

g. Controlled access functional procedures.

h. Two-Person rule requirements.

i. Review of non-radiological hazards (e.g., electrical, ODH) that may be enhanced under controlled access conditions and included as specified by the particular division/section/center.

j. Consequences of violation of controlled access procedures. For employees these can include employee disciplinary measures up to and including termination and for non-employees can include suspension of access to the Fermilab site.

2. The successful completion of an examination will be required before controlled accesses are permitted except for the provisions allowed in Article 653.4. For the initial Controlled Access Training, no challenge examinations are permitted.

3. Special provisions may be established by the responsible division/section/center to accommodate the needs of the occasional non-Fermilab experimenter whose initial visit occurs after normal working hours and who does not enter areas which qualify as radiological areas:

   a. A handout or videotape covering the relevant topics may be made available through the Accelerator Division Operations Department.

   b. The experimenter must read the handout. The experimenter may then make controlled access into the experimental enclosure if escorted by someone on the controlled access authorization list for the area to be accessed who has been given permission to be such an escort by Division/Section/Center RSO.

   c. The experimenter agrees to receive the training within 5 working days of the initial visit.

   d. Such provisions shall be approved by the Division/Section/Center RSO.

4. A comprehensive challenge exam may be used for annual training renewal. One attempt to pass the challenge exam is allowed and will include key questions for which incorrect answers will automatically result in failure. If the individual fails the exam, he/she must be remediated by the Division/SectionCenter RSO or the classroom version of Controlled Access training shall be completed.